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# THE UNITED STATES OF AMERICA

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*February 18, 2005*

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APPLICATION NUMBER: 60/537,890

FILING DATE: *January 22, 2004*

RELATED PCT APPLICATION NUMBER: *PCT/US05/02104*



Certified by

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
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# PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(b)(2).

INVENTOR(s)/APPLICANT(s)					
Given Name (first and middle [if any])		Family Name or Surname		Residence (CITY AND EITHER STATE OR FOREIGN COUNTRY)	
Bruce Phelps		HOLLENBECK		Orefield, PA 18069	
<input type="checkbox"/> Additional inventors are being named on the _____ separately numbered sheets attached hereto.					
TITLE OF THE INVENTION (280 characters max)					
ENGINE POWER STORAGE DEVICE					
CORRESPONDENCE ADDRESS					
<input checked="" type="checkbox"/> Customer Number: 6449					
<input type="checkbox"/> Firm or Individual Name		Rothwell, Figg, Ernst & Manbeck, P.C.			
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages [ 2 ]		<input type="checkbox"/> CD(s), Number _____			
<input checked="" type="checkbox"/> Drawing(s) Number of Sheets [ 2 ]		<input type="checkbox"/> Other (specify) _____			
<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)					
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		Filing Fee Amount:			
<input type="checkbox"/> A check or money order is enclosed to cover the filing fee					
<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 02-2135		\$160.00			
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted

SIGNATURE George R. Repper

Date 1-22-04

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REGISTRATION NO. 31,414  
Docket Number: 1110-314

USE ONLY FOR FILING PROVISIONAL APPLICATION FOR PATENT

## ENGINE POWER STORAGE DEVICE CONCEPT DESCRIPTION

A-04-01-P  
1110-314

- Extra Power is needed only part time
  - Hills
  - Acceleration
  - Light loads
- Power needs grow dramatically when grades increase
  - 150 hp with 80,000 lbs. flat terrain, no headwind
  - 700 hp with 80,000 lbs. 6% grade

Results: Customers buy more hp than they use because of their part time needs

Engine manufacturers design and produce more hp than is requested because of the need to design for average conditions and not specific operating conditions

  - »more expensive components than generally needed
  - »more weight
  - »more cost
- Engines are designed based upon "duty cycle", which takes into account "mission profiles" that the engine must accomplish thru it's life.
  - »Variable strains and loads on the engine which add up to "cumulative damage", meaning that the fatigue life of the engine is "used up" during its expected lifetime.
- Engines are designed for their expected lives
  - Truck engines are conservatively designed because of expected lives of 1-2 million miles
  - Opposite extreme is drag racing engines producing 3000 hp for expected lives of < 1minute!
- The concept of Cumulative Damage is used as the basis for the Invention, where the Damage is measured and stored in the Engine ECU, based upon the actual In Service duty cycle of the engine.

The engine has a nominal hp rating. This could be the same or lower than today's engines because of the future engine's ability to deliver "on demand" power that has been "stored up" over time, since the engine was not "damaged" as much as had been anticipated by the engine design. Refer to Figure 1.
- The Engine ECU (figure 2, Item 4) calculates the "unused engine capacity" based upon sensors installed on the engine and vehicle, measuring parameters such as Engine Speed, Load, Fuel Flow, Vehicle Speed, Load duration, etc. This technology is well known. Today, it is used to calculate extended Oil Drain Intervals. From these sensors, the "damage" to the engine is calculated and the oil drain interval is extended until the oil is fully "used up". Based upon the engine hp "stored", in this manner (refer to Fig. 1A), a signal is sent to a Meter on the truck dashboard, informing the driver that Power has been stored.

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Exhibit A

A-04-01-P  
1110-314

- Under truck driving conditions such as:
  - 1) Passing, where quick acceleration is desired, or
  - 2) Upon climbing a steep gradeIt may be desirable to draw down some or all of the stored power for that purpose.

In that case, the driver 1<sup>st</sup> checks that Stored Power is available based upon the dashboard meter. The duration of the extra power available is a function of what the power is used for and the amount of power stored. The driver will learn by experience what he can use the power for and for how long before it is depleted, shown by an EMPTY gauge.

- If the driver wishes to access the stored power, he activates a switch (Figure 2, Item 5), typically attached to the shift stick. Additional power is supplied up to the maximum allowed (Fig. 1A), up to the maximum demanded. The power is supplied by the engine increasing fuel flow (Figure 2, Item 2) and Air Flow supplied by the electronically controlled turbocharger (Figure 2, Item 1) (mounted on all engines). Because of the additional torque output of the engine under these circumstances, possible driveline damage may occur. To prevent that, vehicle speed is measured (Fig. 2, Item 3). The engine ECU will then only allow for the use of Stored Power above a predetermined road speed, corresponding to a higher numerical transmission gear where torque multiplication is lower (current Industry practice).

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12.16.03

## Exhibit A

Inventors: HOLLENBECK  
Serial No.: New Application  
Filed: January 22, 2004  
Atty Docket: 1110-314  
1 of 2 sheets

A-0401-P  
1110-314

## ENGINE POWER STORAGE DEVICE

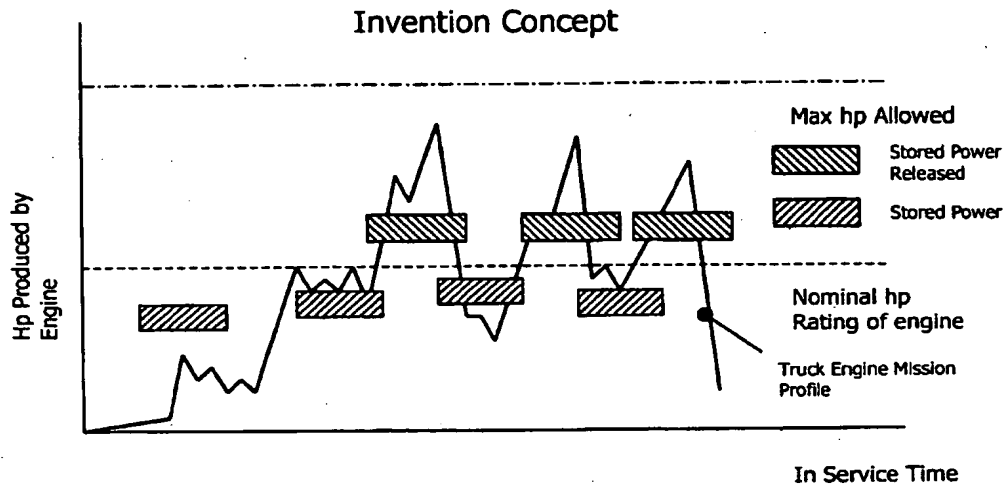


FIGURE 1A

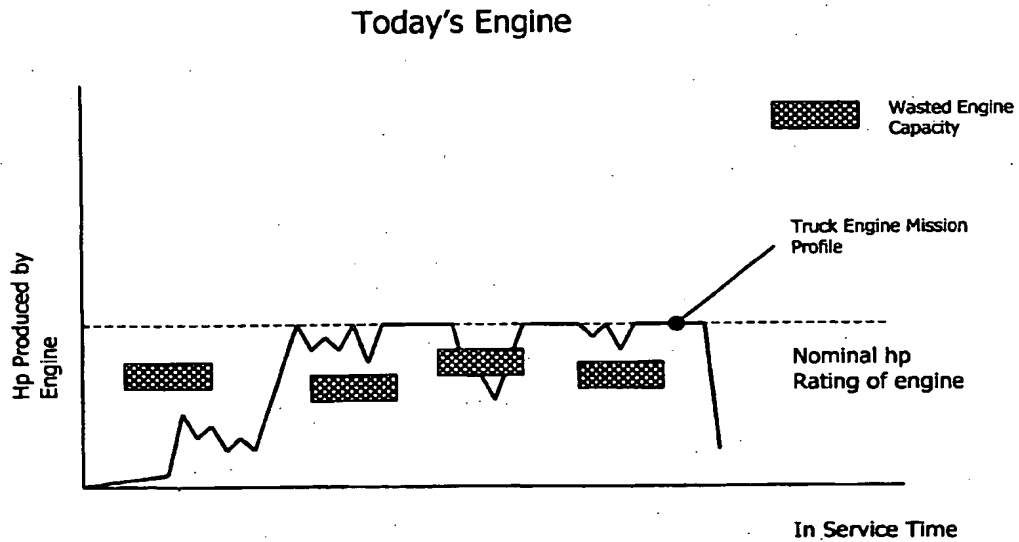


FIGURE 1B

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1110-314

## ENGINE POWER STORAGE DEVICE SCHEMATIC

